# SOIL SURVEY OF THE PARIS AREA, TEXAS.

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## LOCATION AND BOUNDARIES OF THE AREA.

Lamar County, one of the northern border counties of Texas, lies between meridians 95° 15′ and 95° 45′ west longitude, and parallels 33° 25′ and 33° 55′ north latitude. It is nearly square, and has an area of a little more than 900 square miles. Paris, the county seat, is

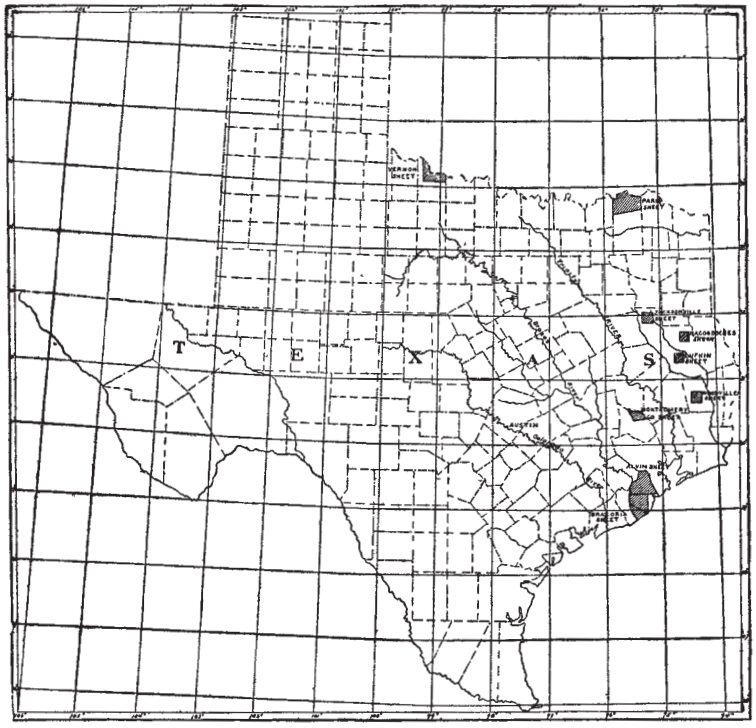


FIG. 25.—Sketch map showing location of the Paris area, Texas.

located very near the geographical center of the county. The area surveyed includes the northern part of the county from the Red River to a point a little south of the line of the Texas and Pacific Railway, which passes through Paris. The area surveyed includes about 550 square miles, or 352,000 acres.

## HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Between 1820 and 1845 occurred the American colonization of Texas, the revolution, the war of independence, and the government of Texas as a distinct nation up to the time of its admission as a State of the American Union.

The first American settlers, coming from Kentucky, Tennessee, Virginia, and the Carolinas, kept to the timbered uplands, because they found there plenty of wood and water, and were better protected from Indians and prairie fires. There were few inhabitants of the country, and the settlers lived chiefly by hunting and fishing. Later cattle raising became the chief industry, and following this a period during which grazing gradually gave way to agriculture.

The earliest farming operations deserving of mention were those on the plantations along the Red River. The farmers were deterred from attempting the cultivation of the black prairie lands, partly because of the difficulty in breaking the dense prairie sod with the crude implements of that day, and partly because it was believed that the heavy black soils would not sustain crops through the summer droughts, which seem to have been more prevalent then than now, and it was not until 1855 that the settlements began to encroach upon the prairie soils to any great extent. By this time the stiff, dense sod had become weakened by the tramping and grazing of stock. Once under cultivation these lands proved their superior quality and their special fitness for cotton and corn.

The prosperity of this section has been founded upon cotton and corn. A large part of the latter is consumed in the area, while cotton is the money crop. Formerly the black, waxy, calcareous soil was largely devoted to wheat. At one time there were several large merchant flouring mills in Paris, but at present there is only one, and that one is a custom as well as a merchant mill. Occasionally a field of wheat still is grown.

The more recent agricultural development of the area has depended chiefly on the production of cotton. The "black lands" of Lamar and Red River counties have some peculiarity, not possessed by the black prairie soils in the counties to the west and south, which enables the growing of an especially fine long staple cotton, known in the markets of the world as "Paris cotton," and it is the exchange of this one commodity, of which the area has a natural monopoly, that has established the commercial prosperity of Paris and the surrounding country.

## CLIMATE.

The climate of this part of Texas is mild and equable, with no long-continued low temperature in winter and no very high temperature in summer. During the winter months decided falls of temperature,

known as "northers," are not infrequent, but they last only a few days and do not seriously interfere with farming operations. Cotton picking continues until Christmas, after which time the amount of outstanding cotton is very small. Preparations for planting the next crop of cotton are made chiefly during the months of January and February. Farm work can be carried on in Lamar County at all seasons of the year. Stock range during nine or ten months of the year, and sometimes longer, and therefore do not require expensive care and feeding to carry them through the winter.

The last killing frost in the spring comes about the middle of March, and from that time until the first of April cotton is planted. Occasionally a late frost comes and does much damage, as was the case in 1903, when the frost of April 30 killed the peaches and all of the cotton and corn, necessitating replanting. Late cotton and corn are very uncertain, because of the ravages of the boll worms.

The average annual rainfall for the twelve years ending with 1902 was 32.26 inches. The minimum amount for any one year during that time was 18.21 inches, while the maximum amount was 50.06 inches. In 1899 and 1900 the annual precipitation was the smallest in twelve years, and since these years were considered the best for cotton and corn in the history of the region, it would seem that ordinarily the seasons are a little too wet for these crops.

The following tables give the normal monthly and annual temperature and precipitation as shown by the records of the Weather Bureau station at Paris:

*Normal monthly and annual temperature and precipitation.*

| Month. | Paris. | | Month. | Paris. | |
|---|---|---|---|---|---|
| | Temperature. | Precipitation. | | Temperature. | Precipitation. |
| | °F. | *Inches.* | | °F. | *Inches.* |
| January | 43.5 | 2.68 | August | 81.7 | 1.82 |
| February | 45.1 | 1.70 | September | 76.1 | 2.47 |
| March | 55.3 | 3.80 | October | 71.4 | 2.13 |
| April | 65.2 | 3.23 | November | 54.0 | 2.06 |
| May | 71.2 | 5.06 | December | 47.8 | 1.98 |
| June | 78.5 | 3.30 | Year | 64.3 | 32.88 |
| July | 82.4 | 2.65 | | | |

## PHYSIOGRAPHY AND GEOLOGY.

During the Cretaceous period all of the Indian Territory south of the Wichita Mountains and all of Texas east of the Trans-Pecos Mountains and the Mexican Cordilleras were submerged in an inland ocean. There were numerous inflowing streams carrying gravel, sand, silt, and clay from the highlands, and those materials were deposited on

the floor of the ocean in the manner that similar materials are now being deposited in the Gulf of Mexico.

The heavier material, like gravel and sand, was dropped in the shallow water near the shore and spread out by the current and waves, while the lighter material, like silt and clay, being held in suspension by the water, was carried farther away from the shore and deposited in quiet waters. There was an abundance of animal life in the ocean at that time, and a luxuriant growth of trees and plants in the marshes and on the highlands bordering them. The "sea shells" found in the rock in the quarries at Honeygrove, and at other points in the area, are the remains of sea animals entombed in material deposited in the Cretaceous ocean, and the lignite, miscalled coal, found in various parts of the area is the remains of trees which grew in the marshes and finally became buried under the sands and clay.

The sandy region extending across the northern part of Lamar County and then west and southwest to the vicinity of Dallas, San Antonio, and Waco, represents the shallow-water, near-shore deposits of the old ocean, while the heavier black, waxy soils immediately to the eastward represent the silts and clays deposited in the offshore quiet waters.

At the close of the Cretaceous period there was an uplift which converted the whole region—from the eastern border of the belt of black, waxy soils to the mountains—into dry land. The shore line in the period that followed is represented by the sandy region immediately east of this black, waxy belt.

The Cretaceous materials in Lamar County belong to what is known as Upper Cretaceous. They have been subdivided into formations, known as the Woodbine formation, the Eagleford formation, the Austin Chalk formation, and the Taylor formation. Each of these has its own peculiarities of construction, which, under the action of climatic agencies, results in different kinds of landscapes and in distinct types of soil.

The Woodbine formation is the oldest of the four. It is known in other parts of the United States as the Dakota sandstone and is composed for the most part of unconsolidated ferruginous and argillaceous sands. The Red River flows through this formation, but owing to the immense alluvial deposits in the valley the underlying rock is exposed in only a few places. The area in Lamar County covered by this formation lies between the Red River and a line drawn about east and west across the county in the vicinity of Lenoir. It is a hilly region and washes badly when cleared. It is covered for the most part with blackjack and post oak.

The Eagleford formation occupies a wide belt immediately south of the Woodbine formation and extending east and west across the county, and is best developed between Paris and Pine Creek. The

character of its clays and marls can be seen in the well at King's place near Givens, or at the brick works north of Paris. For the most part these clays and marls are black or blue in color and are somewhat bituminous. In the eastern part of the area the region occupied by this formation is hilly and rolling and covered mostly by blackjack and post oak, while in the western part it becomes a level, treeless prairie. It weathers chiefly into the Orangeburg clay and Lufkin clay soil types. On the latter type, in the western part of the area, there are numerous small sand mounds, averaging about 2 feet in height and 15 feet in diameter. The tops of the mounds are quite sandy, while the depressions between are inclined to be heavier. These mounds owe their origin to the action of the wind at the close of the Cretaceous period, or shortly after the uplift when the whole country was a desert. The wind-blown sands lodged in the scant vegetation in the same manner that sands collect at present around the scant vegetation in the Colorado Desert. These mounds are found in all parts of the area occupied by the sandy Woodbine and Eagleford formations, regardless of forests or prairie. Parts of these formations are still treeless because the trees have not had time to spread, or because they were held in check by prairie fires. Since the country has been settled and these fires have been checked the forests are encroaching upon the prairies.

The Austin Chalk formation consists chiefly of unconsolidated clays and impure chalk, and weathers into a grayish-brown silt loam or clay loam. It occurs as a narrow strip from half a mile to 2 miles wide, extending east and west from Paris, and occupies the region shown on the soil map as Houston Clay. It is for the most part treeless, except for a few bois d'arcs. It is slightly undulating and a little lower than the region to the south of it. In the deep cuts along the road the subsoil at a depth of 4 or 5 feet often has a bluish color, and farther down the unconsolidated rock sometimes appears as a gray or white clay or chalk.

The Taylor formation is composed almost entirely of unindurated layers, firm rock strata being few and exceptional. The beds are mostly calcareous clays, which are locally known as "joint" clays. These clays and marls disintegrate so rapidly that the character of the unaltered beds is seldom seen except in wells. When brought up from lower depths it can be seen that a large portion of the material is lying in a chalky condition. This formation weathers into the Houston black clay.

The isolated inland areas of Houston black clay and Houston clay are thin mantles of the Austin chalk and Taylor formations, which have not been entirely removed by erosion from the underlying Eagleford formation. The Houston clay to the northward occurs on the divide between the Red and Sulphur rivers, and therefore represents

the highest portion of the area. Paris, on the edge of the Houston clay belt, has an altitude of 600 feet above tide. North of the divide the area slopes gradually toward the Red River, and to the south it slopes toward Sulphur River. The general slope of the county, however, is toward the southeast. The reason for the slope toward the Red River is that the stream has found the Dakota sandstone very susceptible to erosion, and has followed the line of least resistance.

## SOILS.

Eleven different types of soil, covering a wide range in texture, were mapped in the Paris area. The extent of each of these types is shown in the following table:

*Areas of different soils.*

| Soil. | Acres. | Per cent. | Soil. | Acres. | Per cent. |
|---|---|---|---|---|---|
| Orangeburg fine sandy loam | 69,148 | 19.7 | Vernon fine sand | 13,312 | 3.8 |
| Lufkin clay | 61,696 | 17.6 | Orangeburg sandy loam | 12,224 | 3.5 |
| Orangeburg clay | 59,136 | 16.9 | Sanders loam | 10,112 | 2.9 |
| Houston clay | 40,064 | 11.4 | Orangeburg silt loam | 8,512 | 2.4 |
| Houston black clay | 35,008 | 10.0 | Total | 350,464 | ..... |
| Houston silt loam | 22,080 | 6.3 | | | |
| Sharkey clay | 19,136 | 5.5 | | | |

### ORANGEBURG FINE SANDY LOAM.

The soil of the Orangeburg fine sandy loam consists of from 10 to 20 inches, and occasionally more, of a gray sand of very fine to medium texture. The average depth of the sand is 12 inches. The subsoil is a sandy clay, mottled with red, gray, and yellow. The soil of this type differs from the Orangeburg sandy loam in being finer in texture and lighter in color, and the subsoil differs from the subsoil of the Orangeburg types found in the area in that it is not so compact and impervious in texture. It is a residual soil, derived from the slow weathering of the Dakota sandstone or Woodbine formation.

This soil is found in a continuous strip, varying from 2 to 10 miles in width, in the northern part of the county. Its topography is made up of low, rounded, wooded hills. Owing to these irregular surface features there are numerous clay hills, which represent places where the sand has been washed off into depressions or the streams. On the southern boundary of the type there are a great many such spots which were not large enough to map on the scale used. Where they were large enough to be mapped they were classed with the Orangeburg clay, because they are very similar to that type, and their agricultural value is the same. One large area thus mapped extends from the vicinity of Lenoir to Pine Creek. The few shortleaf pine trees growing in the area are always found upon this type.

The surface drainage of the type is good, the run-off being, in fact, too rapid, causing the soil to wash badly, except where the ground is level or in a depression. Only the level areas have been chosen for growing crops. About 10 per cent of the type is under cultivation.

This type is regarded as a rather poor soil, and needs careful handling. Nearly all the crops of the area are grown upon it to some extent. Cotton yields from one-fourth to three-fourths of a bale per acre, depending upon the location and methods of cultivation. Corn yields from 10 to 25 bushels, with an average of about 20 bushels per acre. Melons, vegetables, and potatoes are grown to some extent. There are also a few peach orchards upon the type. It is used on a smaller scale for the same class of truck farming as is the Orangeburg sandy loam, but is not so desirable as the latter. It is greatly benefited by growing cowpeas and alfalfa, and if carefully handled will produce paying crops of peaches, melons, berries, and vegetables. It is a desirable type for light farming, and can be purchased in small tracts by those with limited means.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

*Mechanical analyses of Orangeburg fine sandy loam.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10059 | ¼ mile S. of Arthur City. | Fine sandy loam, 0 to 20 inches. | 0.49 | Tr. | 1.34 | 1.68 | 18.46 | 40.22 | 32.48 | 5.02 |
| 10061 | Hinckley..... | Gray fine sand, 0 to 18 inches. | 2.30 | 0.38 | 1.70 | 3.76 | 32.84 | 27.88 | 27.70 | 5.22 |
| 10063 | 2 miles E. of Belk.. | Sandy loam, 0 to 12 inches. | .77 | .36 | .64 | .96 | 7.86 | 18.14 | 59.56 | 12.40 |
| 10060 | Subsoil of 10059.... | Yellow sandy clay, 20 to 36 inches. | .30 | .16 | 1.06 | 1.40 | 24.52 | 26.56 | 19.40 | 26.80 |
| 10064 | Subsoil of 10063.... | Red sandy clay, 12 to 24 inches. | .29 | .40 | .76 | .60 | 5.16 | 12.08 | 48.72 | 32.40 |
| 10062 | Subsoil of 10061.... | Yellow sandy clay, 18 to 40 inches. | .50 | 1.00 | 6.80 | 5.92 | 19.62 | 9.72 | 12.80 | 44.16 |

HOUSTON SILT LOAM.

The surface soil of the Houston silt loam consists of from 4 to 15 inches of grayish-brown fine sandy or silty loam, with an average depth of about 10 inches. The subsoil to a depth of 36 inches is a stiff and rather impervious silt loam or clay, varying in color from yellowish gray to grayish brown, and streaked occasionally with narrow bands of a reddish cast. Below this depth the yellow often predominates,

and the subsoil, like that of the Houston clay, gradually grades off at a depth of 5 or 6 feet into a soft, rotten, chalky, or marly material. The Houston silt loam and the Houston clay differ chiefly in the depths and colors of their soils, the subsoils being very similar. The Houston silt loam is a product of slow weathering of both the arenaceous chalk or marl of the Austin Chalk formation and of the Eagleford formation. The greater depth of sand on the Houston silt loam shows it to be a closer shore deposit than the Houston clay. By referring to the map this becomes more apparent, for it can be seen that the main body of this type extends in a northeasterly and southwesterly direction immediately to the north of the main body of Houston clay.

Several streams, including Pine Creek and Sanders Creek, have their sources in this type, and give it excellent drainage. The soil, however, when broken up, loses moisture rapidly unless frequent cultivation is resorted to. For this reason it has been found more profitable to leave a large proportion of the area of the type in hay and pasture lands, and at present about 75 per cent of this soil is used for these purposes.

The farmers who live upon this soil type are obliged to pursue a more diversified system of farming than is practiced upon the heavier types to the southward. The average yield of cotton is about one-third bale per acre, while corn will produce on an average about 20 bushels to the acre. It is considered better adapted to wheat and oats than the heavier clay types, because it is a little earlier and the grain does not grow so rank as to lodge before harvesting. The average yield of wheat is 15 bushels per acre, although yields of 20 bushels are not uncommon. Oats usually average about 40 bushels per acre, and are fed mostly in the sheaf.

Alfalfa does well after it is thoroughly established, but in most instances difficulty is experienced in getting a satisfactory stand. Bermuda grass is grown to some extent as a pasture grass. The native prairie grass is grown on the hay farms and the quality and yields are very satisfactory, the yield ranging from 1 ton to 1½ tons per acre.

The following table shows the texture of the soil and subsoil of typical samples of Houston silt loam:

*Mechanical analyses of Houston silt loam.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10087 | 2 miles NE. of High. | Gray loam, 0 to 10 inches. | 1.70 | 1.04 | 1.16 | 1.04 | 5.82 | 15.14 | 63.08 | 12.32 |
| 10089 | ¼ mile E. of Emberson. | Silty loam, 0 to 14 inches. | 1.07 | .44 | .60 | .90 | 8.26 | 15.28 | 60.52 | 14.00 |
| 10085 | 1 mile SW. of Gibbons. | Loam, 0 to 10 inches. | .86 | .36 | 1.28 | 2.66 | 26.68 | 7.18 | 37.52 | 24.20 |
| 10090 | Subsoil of 10089.... | Silty clay, 14 to 36 inches. | .16 | .60 | .78 | .68 | 4.78 | 8.76 | 51.08 | 32.80 |
| 10088 | Subsoil of 10087.... | Brown clay, 10 to 34 inches. | 1.07 | .50 | .64 | .56 | 2.62 | 7.50 | 50.86 | 37.12 |
| 10086 | Subsoil of 10085.... | Brown clay, 10 to 36 inches. | 1.14 | .18 | .46 | 1.94 | 18.10 | 5.18 | 26.84 | 47.28 |

## SANDERS LOAM.

The soil of the Sanders loam is a sandy loam or loam containing sand from medium to coarse in texture. In color it is dark brown or reddish brown, and occasionally grayish. The darker color in places is due to decaying leaf-mold from local forests. In places the soil contains considerable silt and clay. The subsoil is lighter in color and contains a larger percentage of silt and clay.

This soil is found typically developed in narrow strips along Pine Creek and Sanders Creek, between the areas mapped as Sharkey clay and the edge of the valleys, and occasionally it extends up the sides of the hills a considerable distance. It is also found in the bottoms of all the small streams in the sandy regions. Along Pine Creek and Sanders Creek this soil is composed largely of the wash from the higher sandy hills, while along the smaller creek bottoms it is an alluvial soil.

Its topography varies from the level and flat areas along the stream bottoms to those which slope from the foot of the valleys toward the streams. In most locations it is subject to annual inundations, and would be greatly improved by the construction of drains from the base of the hills to the channel of the streams. Along Sanders Creek and Pine Creek its subsoil water is in many places held back by the strip of impervious Sharkey clay which separates the type from the stream, and as a result it is permanently saturated with water at about 18 inches below the surface. Such areas would be greatly benefited if

ditches were dug through the Sharkey clay to the streams. Along the lower slopes of the hills this soil is usually well drained.

Only about 12 per cent of this type is under cultivation. The principal crops grown are corn and cotton, the soil being considered more desirable for the former than for the latter. In a good year corn will average 45 bushels per acre, while cotton will yield about half a bale per acre. In the best locations it is fairly well suited to these crops. If properly drained it might produce sweet and Irish potatoes and possibly general truck crops.

The following table gives mechanical analyses of both soil and subsoil of this type:

*Mechanical analyses of Sanders loam.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10094 | 3 miles S. of Lenoir. | Brown sand, 0 to 20 inches. | 0.54 | 0.10 | 0.14 | 0.46 | 19.06 | 32.68 | 39.96 | 7.20 |
| 10092 | 3 miles S. of Chicota | Brown loam, 0 to 18 inches. | 2.03 | .36 | 2.10 | 3.20 | 10.74 | 14.22 | 48.02 | 20.88 |
| 10096 | Sanders Creek..... | Loam, 0 to 15 inches. | 2.43 | .28 | 1.12 | 1.26 | 11.16 | 14.30 | 43.80 | 27.50 |
| 10095 | Subsoil of 10094.... | Yellow sandy loam, 20 to 36 inches. | .12 | .00 | .00 | .80 | 28.14 | 31.60 | 26.00 | 13.04 |
| 10093 | Subsoil of 10092.... | Loam, 18 to 40 inches | 1.31 | .70 | 3.00 | 4.60 | 13.88 | 14.62 | 42.78 | 19.70 |
| 10097 | Subsoil of 10096.... | Loam, 15 to 36 inches | .59 | Tr. | .38 | .32 | 23.12 | 26.50 | 29.62 | 20.00 |

HOUSTON CLAY.

The Houston clay consists of from 0 to 4 inches of light-brown to brown very fine sandy loam or silt loam, underlain by either a brownish-yellow or grayish-yellow clay loam or clay which usually becomes quite stiff and tenacious at a depth of 24 inches. Below 36 inches the subsoil becomes lighter in color, and grades off gradually into a light-blue rotten shale. In dry weather the soil presents a light-gray appearance, which in wet weather changes to a grayish brown. The yellowish cast of the subsoil when it is very near the surface gives to a newly plowed field a markedly streaked appearance, which has given rise to the term "mixed land." This type is also known by the local term of "tallow-ridge land."

Scattered upon the surface, and throughout both soil and subsoil, small deposits of iron concretions, averaging one-tenth of an inch in diameter, are occasionally found. In places there are a few waterworn pebbles and some fossil shells.

This type occurs as a gently undulating prairie, and wherever it is adjacent to the Houston black clay its formation is due to a mixture of the latter with some one of the sandy types. The largest and most important body of this type extends across the entire survey from east to west, just north of the area of Houston black clay, and passes through the southern part of Paris. This strip varies from one-half mile to 2 miles in width. An area of this type, about 2 miles in width, extends from Maxey to Sumner, a distance of about 5 miles. About 1½ miles north of Paris begins another irregular body of this type, which contains about 7 square miles. Several smaller areas are found in the southern part of the area surveyed.

This type was originally a treeless prairie, save for a few bois d'arcs which are still growing in places.

The drainage features are good, one characteristic being the presence of deeply washed ditches in the vicinity of the contact between this type and the Houston black clay. West of Paris this type forms the divide between the Red and Sulphur rivers. In the rainy season the soil absorbs moisture well and retains it in time of drought. As with the Houston black clay, level cultivation is not practiced. The cotton is planted upon ridges, so as to make early planting possible.

The Houston clay is a residual soil derived from the slow weathering of the arenaceous shales of the Austin chalk formation. These beds were a closer shore deposit than the formation from which the Houston black clay is derived, as shown by the presence of sand and a few waterworn pebbles.

About 90 per cent of this type is farmed, the principal crops being cotton, corn, and hay. A few peaches, apples, pears, and grapes are grown, but usually only for family use. The average yield of cotton is from one-half to two-thirds of a bale per acre, while corn averages about 30 bushels. Hay is one of the principal crops on this type, the yield ranging from 1 ton to 1½ tons per acre. Formerly wheat was grown quite successfully. Oats are grown to some extent at present, the average yield being about 50 bushels per acre. Alfalfa is also grown, giving a yield of from 4 to 6 tons per acre for the season. This soil type is infected in places by the germ of the cotton root rot disease, and wherever this is the case alfalfa can not be grown until the fungus is eradicated from the soil. In most localities the Houston clay is considered next in value to the Houston black clay, but like the latter it has decreased in productiveness through constant cropping without rotation or rest. It is greatly benefited by deeper plowing and the turning under of cowpeas. The average price per acre is about $45.

The following table shows the texture of typical samples of the soil and subsoil of the Houston clay:

*Mechanical analyses of Houston clay.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10074 | 3 miles N. of Petty. | Brown silty loam, 0 to 4 inches. | 2.07 | 0.14 | 0.48 | 0.50 | 4.36 | 3.22 | 74.16 | 16.98 |
| 10072 | Paris ..... | Brown silty loam, 0 to 8 inches. | 1.68 | .00 | .48 | 2.46 | 6.18 | 3.40 | 68.00 | 19.10 |
| 10076 | 1 mile S. of Davis.. | Brown silty loam, 0 to 8 inches. | 1.92 | .66 | 1.72 | 2.88 | 9.40 | 6.62 | 42.50 | 36.16 |
| 10073 | Subsoil of 10072.... | Brown stiff clay, 8 to 36 inches. | .41 | Tr. | .44 | 2.10 | 5.10 | 2.32 | 59.00 | 30.98 |
| 10077 | Subsoil of 10076.... | Brown clay loam, 8 to 36 inches. | 1.31 | .58 | .64 | 1.86 | 9.78 | 3.94 | 46.16 | 36.34 |
| 10075 | Subsoil of 10074.... | Brown clay loam, 4 to 30 inches. | 1.14 | .14 | .26 | .28 | 1.44 | 7.98 | 45.40 | 44.50 |

HOUSTON BLACK CLAY.

The soil of the Houston black clay is composed of from 6 to 10 inches of dark-brown to jet-black clay loam or clay. It is locally known as "black waxy" land. When dry and well cultivated it is friable and easily worked, but when wet it becomes gummy and waxy, in this condition closely resembling the Marshall clay in the valley of the Red River of the North. The subsoil is the same as the soil in composition, except that it does not contain so much organic matter. In color it changes from a dark brown at a depth of 30 inches to a light blue, and finally to a yellow at a depth of 5 feet. If not cultivated in dry weather it bakes and cracks, and sometimes these cracks become so deep and wide that one can insert his whole arm. In dry weather the roads often become very hard and compact, and glisten with a metallic luster. In wet weather they are well-nigh impassable, the spokes of wagon wheels becoming filled with mud and presenting the appearance of mud disks. Sometimes these disks become so large that they rub the body of the wagon, and along the roads may be seen great piles of this mud, where the farmers have stopped to clean off the wheels. When dry these piles become very hard and crumble, but the lumps are slaked and fall to pieces in the first ensuing rains.

Scattered upon the surface and throughout both soil and subsoil are small concretions of calcium carbonate, varying in size from small particles to pieces 1 or 2 inches in diameter.

The entire southern part of Lamar County is composed of this type of soil, but the intention in this survey was to include only enough of

this type to be representative; consequently it appears on the southern border of the map as a strip from 1 to 2 miles wide.

Approaching this type from the north, the region appears as a gently rising ridge, but after reaching its summit and looking to the southward, it is apparently a level prairie, thickly populated and dotted here and there with bois d'arc trees and an occasional mesquite bush. Closer inspection shows it to be a gently undulating prairie, sloping gradually toward the southeast, and cut here and there by deep, wide waterways. There is no running water in these valleys except in wet weather. Notwithstanding the good drainage features of this type, its ability to retain moisture often renders it difficult to till for a long time after a copious rain. Level cultivation is not practiced, because it would retard planting or cultivation from a week to ten days after such rains.

The Houston black clay is a residual soil, derived from the weathering of white limestone of the Taylor beds or the beds immediately overlying them. The important mineral characteristic of this type is its large calcareous content. Its black color is largely due to the chemical change which takes place when decaying organic matter comes into contact with the calcium carbonate in the soil.

The Houston black clay is entirely under cultivation and is regarded as one of the strongest, if not the strongest, type in the area. It is productive and easily tilled, and in the past it has been looked upon as the most desirable type in the area for cotton and corn. It has been used almost exclusively for these crops for more than twenty years, and the evil effects of such a practice are seen in the "dead spots" in the cotton fields. The continual planting of a soil to a single crop for so long a time favors the formation in the soil of special fungi which prey upon the plant. The continual cultivation of cotton on this soil has resulted in the accumulation of the fungus causing root rot. Experience has shown that if the growing of cotton or other susceptible crops is discontinued for a year or two the fungus is greatly reduced. Rotation is one of the best ways of controlling the disease.

The average yield of corn is from 40 to 50 bushels per acre, although larger yields have been grown. Cotton averages 1 bale per acre in good seasons. Formerly wheat was grown extensively, the yield being about 25 bushels per acre. Oats is sometimes grown, the yield being about 60 bushels per acre. This crop is usually fed in the sheaf. Onions are found to be a profitable crop. Some celery is grown for domestic use. The Houston black clay is also an excellent pasture land when seeded to Bermuda grass, or where the native prairie grass has never been destroyed, but its present high value prevents its being used to any great extent for pasturage. Alfalfa does well, but is killed by the fungus which attacks the cotton. The average value of this land is $50 an acre.

The following table gives mechanical analyses of typical samples of the soil and subsoil of this type:

*Mechanical analyses of Houston black clay.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10083 | ¼ mile NE. of Petty. | Black clay, 0 to 12 inches. | 1.40 | 0.46 | 0.90 | 0.56 | 2.20 | 6.08 | 56.62 | 33.44 |
| 10079 | 2 miles S. of Paris.. | Black clay, 0 to 10 inches. | 1.40 | .20 | .50 | .80 | 2.60 | 1.64 | 55.08 | 38.60 |
| 10081 | 2 miles S. of Davis. | Brown clay, 0 to 10 inches. | 3.02 | .74 | 1.18 | 1.88 | 17.64 | 9.82 | 24.86 | 44.80 |
| 10080 | Subsoil of 10079.... | Brown waxy clay, 10 to 40 inches. | .98 | .16 | .86 | 1.24 | 4.60 | 3.96 | 48.68 | 40.10 |
| 10084 | Subsoil of 10083.... | Black clay, 12 to 40 inches. | 2.83 | 2.16 | 2.22 | .92 | 2.96 | 4.24 | 45.80 | 41.62 |
| 10082 | Subsoil of 10081.... | Stiff clay, 10 to 40 inches. | 2.40 | .26 | .68 | 1.34 | 9.84 | 6.82 | 29.52 | 52.20 |

The following samples contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 10081, 9.53 per cent; No. 10082, 8.80 per cent; No. 10083, 11.20 per cent; No. 10084, 9.29 per cent: No. 10080, 0.78 per cent.

ORANGEBURG SANDY LOAM.

The soil of the Orangeburg sandy loam is a medium to coarse sandy loam, varying in depth from 8 to 24 inches, with an average depth of about 18 or 20 inches. In dry weather it is gray or grayish yellow on the surface, while in wet weather it is inclined to be red. It is locally known as "red sandy land." The subsoil is typically a red sandy clay, with a depth of several feet, although sometimes it is made up of red, yellow, and gray sandy clay. On the tops of the ridges and knolls the sand is sometimes washed off, exposing the red subsoil. Disseminated through both soil and subsoil are some small iron concretions, and their presence has in some places given rise to the term "gravelly land" for this type.

In the vicinity of Mansfield schoolhouse the sand has become cemented with iron, forming a ferruginous sand rock, which outcrops upon some of the ridges.

This soil occurs as a strip from 1 to 2 miles wide in the southern part of the area and extends eastward from the vicinity of Paris to the county line. For the most part it is limited to a gently rolling ridge, which serves as a divide between the Red and Sulphur rivers. Its slightly elevated position and gently rolling character insure good drainage. It is derived from a ferruginous sand rock belonging to the Eagleford formation.

Formerly the areas of this soil were covered with forests of red oak, hickory, and post oak. At present 75 per cent of it is under cultivation, being used extensively for fruit and truck farming. It is recognized as the best soil in the area for diversified farming. Some cotton and corn are grown, the average yield of the former being half a bale per acre and of the latter about 25 bushels per acre.

The farms upon this type are all small and well cultivated. The owners live upon them and are well-to-do. They are the farmers who have contributed largely to the progress of the region in the matter of diversified farming. They raise corn, some small grain, garden vegetables, truck, fruit, berries, etc., and keep beef and dairy cattle, hogs, poultry, and bees. They thus produce many of the necessaries of life, and are compelled to buy little else than coffee, tea, sugar, and clothing. The size of the farms ranges from 40 to 150 acres, with values ranging from $25 to $100 an acre. and very little land for sale at any price.

Large quantities of peaches are shipped annually from the farms on this soil. Sweet and Irish potatoes do remarkably well. Two crops of the latter are grown each season. About 100 carloads of the first crop are shipped north each spring, reaching the markets from thirty to sixty days earlier than the Colorado crop. In the fall some of the farmers dispose of a large part of the second crop by trading them, bushel for bushel, for corn from the black land sections. A good average yield for the second crop of potatoes is about 65 bushels per acre. Sweet potatoes do well, but are consumed mostly at home. This region is well known for the fine quality of cantaloupes which it produces, and large numbers are shipped every spring. Strawberries are one of the leading crops, and heavy shipments are made to St. Louis and Chicago, and sometimes as far as New York City.

The following table shows the texture of both soil and subsoil of this type:

*Mechanical analyses of Orangeburg sandy loam.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10106 | Mansfield ..... | Sandy loam, 0 to 18 inches. | 0.77 | 1.70 | 3.18 | 39.72 | 28.10 | 6.80 | 15.16 | 5.10 |
| 10104 | 3½ miles E. of Paris. | Sandy loam, 0 to 20 inches. | .71 | .32 | 3.24 | 27.50 | 34.40 | 9.48 | 18.00 | 6.42 |
| 10105 | Subsoil of 10104.... | Red sandy clay, 20 to 40 inches. | .44 | .20 | 2.10 | 20.10 | 31.00 | 6.10 | 16.44 | 23.98 |
| 10107 | Subsoil of 10106.... | Sandy clay, 18 to 36 inches. | .42 | 1.20 | 2.44 | 24.44 | 20.04 | 3.46 | 11.68 | 36.98 |

ORANGEBURG CLAY.

The soil of the Orangeburg clay, which has an average depth of 8 inches, is a red loam or clay loam, and is covered with from 2 to 4 inches of fine sand in localities which have never been deforested. The subsoil is a stiff, tenacious, brown, red, or gray mottled clay loam or clay to a depth of 4 or 5 feet, below which is usually found a gray stratified clay containing a few fragments of rotten shale.

This type is largely confined to the sandy regions north of the extensive body of Houston clay, and south of Pine Creek. The largest bodies of it occur in the south-central part of the area. It is typically developed on the Tigertown road, south of Pine Creek, 2 miles northwest of Paris, and also on the Pine Bluff road northeast of Paris, in the vicinity of Givens and Faught. In the northern part of the area there are a few isolated patches of this type, but they are usually areas where the sand of the Orangeburg fine sandy loam has washed so badly as to expose the red sandy subsoil. These patches were not extensive enough to justify the establishment of a new type, and their characteristics and agricultural values were enough like those of the Orangeburg clay to justify classing them with that type.

This soil is nearly always found in the hilly, rolling country, and its drainage features are good—too good, in fact, because when cleared the shallow sand and sandy loam wash off readily, exposing the stiff, unproductive red subsoil.

The well water on this type is considered very poor, and in some cases is said to contain alkali. The subsoil is very compact and quite impervious to water. To secure water for their stock the farmers usually dig hollows, in which the rain water is collected.

In this area the Orangeburg clay is a residual soil, derived from the slow weathering of the sandy clays of the Eagleford formation.

Only about 5 per cent of the area classified and mapped as Orangeburg clay has ever been cleared and brought under cultivation. The natural timber growth is hickory and blackjack and post oak.

Cotton and corn are the principal crops grown. The average yield of the former is about one-third of a bale per acre, while the latter averages about 15 bushels per acre. This is regarded as a very undesirable soil. When the area becomes more thickly settled and lands in greater demand, this type can probably be cleared and successfully cultivated, provided the fields are terraced. The ordinary yields on this type are doubled when cowpeas are used as a fertilizer.

The table on the next page gives mechanical analyses of typical samples of the soil and subsoil of this type.

*Mechanical analyses of Orangeburg clay.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10100 | ¼ mile SW. of Gibbons. | Red sandy clay, 0 to 8 inches. | 1.21 | 0.52 | 1.20 | 3.60 | 36.20 | 18.72 | 27.24 | 12.00 |
| 10098 | 2 miles W. of Paris. | Red sandy clay, 0 to 7 inches. | 1.23 | .50 | 1.24 | 3.54 | 19.66 | 21.36 | 35.82 | 17.24 |
| 10102 | 3 miles SW. of Faught. | Red sandy clay, 0 to 8 inches. | 2.21 | .44 | 1.18 | 1.18 | 9.08 | 11.62 | 27.50 | 49.40 |
| 10101 | Subsoil of 10100.... | Red clay, 8 to 36 inches. | .34 | .24 | .62 | 2.36 | 25.16 | 10.78 | 19.00 | 41.28 |
| 10099 | Subsoil of 10098.... | Red clay, 7 to 36 inches. | .39 | .30 | .54 | 2.00 | 12.96 | 14.92 | 20.20 | 48.96 |
| 10103 | Subsoil of 10102.... | Red clay loam, 8 to 36 inches. | .41 | .30 | .50 | .30 | 5.10 | 13.96 | 17.20 | 62.20 |

VERNON FINE SAND.

The soil of the Vernon fine sand is a loose sand or sandy loam ranging in depth from 14 to 20 inches, but averaging about 15 inches. The texture is fine, and the color ranges from gray to reddish gray, depending upon the state of moisture. The presence of considerable quantities of organic matter in some locations tends to make the soil darker in color and more loamy. The subsoil to a depth of several feet is a loose sand of fine texture, containing little or no organic matter, and of a reddish or yellowish color.

This type is confined to the Red River Valley, and is found in all locations from the banks of the stream to the hills at the edge of the valley. The Red River began its existence at the close of the Cretaceous period, so that the upland phase of the type was doubtless deposited in Tertiary times, while some of the lowland phase is being deposited now. In cutting its valley through the soft sandstone and sand of the Woodbine formation the river has had little fall and has meandered over a wide area. It has slowly deepened its channel, so that the upland phase of the type is seldom subject to overflow. The lowland areas are flooded annually.

Owing to its loose texture this type dries readily as soon as the flood subsides. In its upland phase drainage features are excellent, for in wet weather the excessive rains are readily taken up, while in times of drought the capillary properties of the soil bring the moisture from below.

The Vernon fine sand is a deposit of the Red River, and is found in places in the valley where the water movement was too swift to permit the deposition of silt and clay. The isolated areas of this type in

Boggy Bend, 2 miles south of the river, border a depression, formerly a course of the stream, where the soil was deposited in the same manner as it is now being deposited along the present stream.

This type was among the first chosen by the early settlers. The Tinnin plantation at Slate Shoals is located chiefly upon the Vernon fine sand, and is one of the oldest plantations in the county. Before the day of railroads large quantities of cotton, corn, and bacon were shipped down the river to New Orleans. Cotton is still one of the chief products of this soil, the average yield being three-fourths of a bale per acre in good seasons. Corn does better upon this type than upon the heavier Orangeburg silt loam, the average yield being about 50 bushels per acre. During the last few years alfalfa has been introduced, and does very well, the average yield being about 1 ton per cutting, with from 4 to 6 cuttings per season. Usually only enough fruits and vegetables are grown for family use. Some tobacco is also grown, but only for local consumption.

The upland phase of this type is especially adapted to peaches, fruits, and vegetables, being as well suited to these and other trucking products as is the Orangeburg sandy loam. Its distance from local markets and from the railroads, however, has hitherto retarded its development. It is also especially adapted to corn and alfalfa. There is great need of transportation facilities to bring out the agricultural possibilities of this part of the area. The railroad projected through this section will do much to hasten the development here.

The following table gives mechanical analyses of the soil and subsoil of this type:

*Mechanical analyses of Vernon fine sand.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10118 | Slate Shoals..... | Fine gray sand, 0 to 18 inches. | 0.21 | 0.00 | 0.28 | 0.20 | 49.20 | 41.94 | 5.90 | 2.12 |
| 10116 | Arthur ..... | Loamy fine sand, 0 to 15 inches. | .87 | Tr. | 4.32 | 15.14 | 38.14 | 14.34 | 22.00 | 5.50 |
| 10114 | Chicota..... | Fine sandy loam, 0 to 12 inches. | .95 | .10 | .34 | .28 | 3.26 | 36.90 | 48.58 | 10.20 |
| 10115 | Subsoil of 10114.... | Brown fine sand, 12 to 36 inches. | .79 | .00 | .10 | .00 | 10.20 | 68.00 | 16.90 | 4.90 |
| 10119 | Subsoil of 10118.... | Brown sand, 18 to 40 inches. | .14 | .00 | .56 | 1.22 | 5.10 | 47.02 | 39.40 | 6.80 |
| 10117 | Subsoil of 10116.... | Loose medium sand, 15 to 40 inches. | .16 | .16 | 3.36 | 13.10 | 36.26 | 14.22 | 22.60 | 10.16 |

The following samples contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 10114, 3.60 per cent; No. 10115, 3.20 per cent; No. 10118, 3.80 per cent; No. 10119, 4.60 per cent.

LUFKIN CLAY.

The soil of the Lufkin clay is a very fine to medium sandy loam or loam, ranging in color from gray to grayish yellow, varying in depth from 10 to 15 inches, and averaging about 12 inches. Occasionally, where the rain wash has carried the material into the depressions, it has a depth of 40 inches. The subsoil is a mottled blue, yellow, or red sandy clay, the yellow and blue colors predominating. Both soil and subsoil are spoken of as a very "close" land, probably from the fact that they contain considerable silt and have a tendency to run together into an almost impervious mass in wet weather. The subsoil usually retains water like a pure clay. In wet weather this soil is quite "mushy" or boggy, acting somewhat like quicksand, and as a result is very difficult to cultivate after a heavy rain. In dry weather the moisture from below does not rise readily, and consequently the type is subject to drought.

This soil is found both in the timbered region in the east-central and northeastern parts of the county and on the treeless prairies in the west-central and northwestern parts of the county. In the wooded regions it is confined to the low-lying, flat, poorly drained areas which are locally known as "ashy flats" or "post-oak flats." The term "post-oak flat" doubtless owes its origin to the fact that post oaks attain their largest size and are most numerous in these locations. Near the railroads the post oak has nearly all been removed, it being considered the most desirable timber in the region for cross-ties. In the prairie regions the type is also confined to the level, flat, poorly drained tracts, which in places are dotted thickly with sand hillocks 2 or 3 feet high by 15 feet in diameter. The depressions between these are usually boggy in rainy seasons, and are referred to as a "tight" soil. The origin of these small mounds has been discussed in the chapter on geology.

The Lufkin clay is a residual soil, derived from the slow weathering of the sandy clays and marls of the Eagleford formation.

In the timbered region about 1 per cent of it has been cleared and put under cultivation, the remainder being covered with a virgin growth of post oak, blackjack oak, hickory, and pin oak. In the prairie region about 10 per cent of this type is under cultivation, while the remainder is nearly all fenced and used either for the production of hay or as a range for stock.

More desirable lands have been so abundant and cheap that the cultivation of this type has been avoided, so that not much can be definitely said as to its possibilities. It has been held for speculation in large tracts by moneyed men, or has been cultivated in small farms by men of limited means. The failure of cotton in the "black land" region during the last three years has induced a number of the tenant

class to buy cheap homes on the Lufkin clay, upon which they are at least sure of growing enough food for their families. One surprising feature of the type is that it produces better crops the second and third years than when first planted, and where cowpeas have been grown and turned under, the crop yields have in some instances been doubled. In the region of the small sand hillocks the yields are much greater after the sand of the elevations has been leveled and incorporated with the soil of the depressions. On the fields where cowpeas have been grown the soil is more loamy, more easily cultivated after a copious rain, and withstands drought better.

This is not a desirable soil for cotton, the average yield being between one-fifth and one-fourth of a bale per acre in the best seasons. The average yield for corn is 12 or 15 bushels per acre. Some sweet potatoes are grown, the yield being about 50 bushels per acre. A few peach orchards have been started, but they do not do as well as upon a coarser sand, or where the subsoil is loose and porous, like that of the Vernon fine sand. With careful cultivation it is said to produce excellent melons and fair berries.

The following table gives mechanical analyses of the soil and subsoil of typical samples of Lufkin clay:

*Mechanical analyses of Lufkin clay.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10122 | ¾ mile SW. of Gibbons. | Brown fine sandy loam, 0 to 20 inches. | 0.93 | 0.00 | 0 70 | 3.10 | 53.40 | 11.70 | 24.42 | 5.98 |
| 10124 | 1 mile E. of Belk.. | Gray loam, 0 to 12 inches. | 1.26 | Tr. | .70 | .70 | 6.30 | 17.88 | 53.12 | 20.50 |
| 10120 | 1 mile N. of Blossom. | Loam, 0 to 10 inches. | .81 | .18 | .40 | .60 | 5.10 | 14.70 | 46.20 | 32.76 |
| 10123 | Subsoil of 10122.... | Sandy clay, 20 to 36 inches. | .48 | .10 | .34 | 2.50 | 39.22 | 9.50 | 24.06 | 24.14 |
| 10121 | Subsoil of 10120.... | Fine sandy loam, 10 to 36 inches. | .64 | Tr. | .50 | .76 | 3.50 | 8.90 | 55.18 | 30.52 |
| 10125 | Subsoil of 10124.... | Sandy clay, 12 to 36 inches. | .65 | .24 | .28 | .56 | 3.08 | 9.40 | 52.86 | 33.32 |

ORANGEBURG SILT LOAM.

The Orangeburg silt loam is composed of a silt loam or silt of a brownish-red or chocolate-red color, varying in depth from 6 to 24 inches, with an average of about 12 inches, underlain by a subsoil redder, usually slightly heavier in texture, and containing less organic

matter. The texture of the subsoil remains the same to about 3 feet or more, where it changes to a fine sandy loam, and sometimes to a medium sandy loam, resembling the subsoil of the Vernon fine sand.

This soil is found in the Red River Valley, back of the front lands, on the level or slightly sloping river benches, and represents the flood plains of the river when it stood at a higher level. In Boggy Bend, the locality where this soil is typically developed, there is a large tract of country which was formerly a vast flood plain, and the whole region is still subject to overflow in times of general flood. Throughout the type, and especially where it borders on the highlands to the southward, there are small marshes and long winding depressions which doubtless represent old channels—cut-offs of the Red River—or depressions eroded in times of high water. Some of the marshes and depressions are partly filled with water throughout the year. The cultivated areas are those which are naturally well drained. The clearings are encroaching upon the lower areas, as the demand for land increases, and artificial drainage is being resorted to. Most of the lowlands belonging to this type can be drained and brought into cultivation.

The Orangeburg silt loam is a deposit of silt and clay left in former times when the river was high and spread out over a large, comparatively level area, where the water movement downstream was slow and therefore favorable to the deposition of the finest materials, like silt and clay. It is never found on the front lands adjoining the stream, where the water movement favored only the deposition of heavier material like sand and gravel. In some locations the front lands are a little higher than the lands back of them. During the spring freshets the water from the river often backs into the low depressions and when the flood subsides the water has no outlet, being held in by the higher ground along the river. The water usually evaporates, soaks into the ground, or else drains off slowly, but in a few places where the depressions are deep and cover large areas they contain water throughout the year. The result is that the suspended materials of the spring flood waters accumulate and gradually build up the bottoms of these depressions. This, together with the wash from the higher grounds, has completely filled some of the old depressions which have been mapped as isolated patches of the type.

It is upon this soil that some of the earliest American settlements were made, and before navigation upon the river commenced little was grown except to supply the needs of families. After navigation was begun a considerable quantity of cotton, corn, bacon, etc., was shipped down the river in exchange for sugar, tea, coffee, and clothing, but in the early seventies navigation ceased and the region did not progress rapidly, although the soil was considered the best in the county for the production of cotton. Since the advent of railroads the development of this region has steadily advanced.

At present cotton, corn, and alfalfa are the principal crops. This type is still so far removed from market that only such fruits and vegetables as are needed for family use are grown, and in several localities where farms are run by tenants they do not cultivate any garden at all.

During the last five years the value of the lands has trebled. A survey is being made for a railroad parallel with the river, and plans for the navigation of the Red River are being strongly agitated. If these facilities be secured the possibilities of the type will be more fully brought out. This soil is especially adapted to cotton and alfalfa. The former yields an average of 1 bale per acre, and sometimes more in a good year, while alfalfa yields 1 ton per acre per cutting, and gives five cuttings each season. Corn does fairly well, the yield ranging from 35 to 40 bushels per acre.

The following table gives mechanical analyses of typical samples of the soil and subsoil of the Orangeburg silt loam:

*Mechanical analyses of Orangeburg silt loam.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10068 | ⅛ mile N. of Johnson's gin. | Brown silty loam, 0 to 12 inches. | 3.69 | 0.00 | 0.16 | 0.22 | 2.34 | 11.18 | 70.48 | 15.34 |
| 10065 | 3 miles N. of Chicota. | Brown silty loam, 0 to 15 inches. | 2.21 | .00 | .16 | .22 | 2.18 | 6.84 | 69.84 | 20.20 |
| 10070 | 2½ miles NE. of Direct. | Silty loam, 0 to 20 inches. | .76 | .00 | .22 | .24 | 1.06 | 2.68 | 58.28 | 37.10 |
| 10069 | Subsoil of 10068.... | Very fine sandy loam, 12 to 36 inches. | 1.01 | .00 | .00 | .00 | 2.52 | 16.36 | 64.24 | 16.64 |
| 10066 | Subsoil of 10065.... | Red silty loam, 15 to 36 inches. | .95 | .00 | .00 | .16 | 2.44 | 9.90 | 64.88 | 22.08 |
| 10071 | Subsoil of 10070.... | Silty loam, 20 to 40 inches. | .20 | .00 | .00 | .20 | 2.18 | 3.90 | 64.20 | 29.68 |

The following samples contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 10070, 5.80 per cent; No. 10071, 6 per cent.

SHARKEY CLAY.

The soil of the Sharkey clay is a grayish-yellow, stiff, waxy, impervious clay, varying in depth from 7 to 12 inches. Occasionally, where there is considerable organic matter, the color ranges from black to chocolate. When wet the soil is very waxy and gummy, but when dry and well cultivated it is friable and easily worked. The subsoil, to a depth of 40 inches or more, is a stiff, waxy, impervious clay, ranging in color from reddish yellow to brownish gray.

The Sharkey clay is found in the northern part of the area, on the deltas formed in the Red River Valley by Pine Creek and Sanders Creek, and also along the whole length of these creeks. It occurs in low, flat areas, ranging in width from one-fourth of a mile to 1½ miles in the creek bottoms, and is hemmed in by the hills on each side. In places where the creek channels are deep and the drainage fairly good the fields are cultivated up to the banks. In places where the channels are shallow the water spreads out and floods the bottoms after every heavy rain, and in such localities the type is still covered with the original forests. This type in all locations is subject to inundation during some part of the year, and level cultivation is not practicable, as it would often retard planting from one to three weeks. Originally this type was heavily forested with pecan, oak, hickory, ash, elm, and hackberry. At present 25 per cent of it is under cultivation, the timber having been either entirely removed or "deadened."

The Sharkey clay is a very productive soil, many fields having been in constant cultivation for a score of years without any apparent change in the yields. This, however, is probably due in large part to the fact that it is flooded every year, and as a result some fertilizing material is left after each flood. Its productiveness, together with the fact that cultivable lands are becoming dearer, has caused the clearings to be gradually extended into the heavily timbered bottoms. In some locations deep ditches with shallow laterals have been constructed, with considerable improvement in the drainage conditions. In one place a large dike has been constructed, and the results have justified the expense, but this can only be done profitably where the bottoms are wide. Where the bottoms are narrow, probably the most inexpensive and successful way to reclaim them is to dig large ditches with shallow laterals, to deaden the large trees, and to remove the undergrowth, so that the water and flood débris may have a free course during the freshets.

This soil type has a purely sedimentary origin. Pine Creek and Sanders Creek began their existence at the close of the Cretaceous period, so that some of these stream deposits are as old as some of those along the Red River. These streams head near the "black land" regions to the south, so that their bottoms are largely Houston black clay and Houston clay redeposited and mixed with the finer particles of other types from which there has been a wash into these streams. All coarser materials, such as sand and gravel, have been largely carried along in the channel where the streams were swiftest, while the suspended material like clay and silt was spread out over the wide bottoms and left as a sediment. The conditions for this deposition were more perfect when there were no clearings, because the undergrowth tended to retard the movement of the water. In some small areas of the type sandy materials are intimately mixed

with the clay and silt, but such areas are so limited in extent that they can not be shown on the map.

The great productiveness and durability of this type are well known. Cotton and corn are the only crops grown to any great extent at present. This soil is especially well adapted to these crops when the season is not too wet. Cotton yields on an average from three-fourths of a bale to 1 bale per acre in a good season, and a good average yield for corn is 40 bushels, although larger yields are not uncommon. Some alfalfa is grown and produces satisfactory yields. Large quantities of pecans are gathered from the timbered portion of the bottoms.

The following table shows the texture of both soil and subsoil of the Sharkey clay:

*Mechanical analyses of Sharkey clay.*

| No. | Locality. | Description. | Organic matter. | Gravel, 2 to 1 mm. | Coarse sand, 1 to 0.5 mm. | Medium sand, 0.5 to 0.25 mm. | Fine sand, 0.25 to 0.1 mm. | Very fine sand, 0.1 to 0.05 mm. | Silt, 0.05 to 0.005 mm. | Clay, 0.005 to 0.0001 mm. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* | *P. ct.* |
| 10112 | N. of Paris..... | Brown clay, 0 to 8 inches. | 1.62 | 0.00 | 0.56 | 0.66 | 4.76 | 2.66 | 39.02 | 52.30 |
| 10110 | Sanders Creek..... | Brown clay, 0 to 9 inches. | 4.22 | .00 | .30 | .50 | 4.60 | 3.40 | 22.80 | 68.40 |
| 10113 | Subsoil of 10112.... | Brown clay, 8 to 36 inches. | 1.50 | .00 | .38 | .48 | 1.80 | 5.58 | 40.50 | 51.00 |
| 10111 | Subsoil of 10110.... | Red waxy clay, 9 to 36 inches. | 1.42 | .00 | .58 | 1.00 | 6.46 | 5.40 | 25.10 | 61.26 |

## AGRICULTURAL CONDITIONS.

The Paris area is in the division of the State known as the "black land belt," which extends from the Red River on the north to the Rio Grande on the south. This belt, which is almost exclusively an agricultural region, has an average width of less than 100 miles and a length of about 400 miles. It includes such cities as Paris, Dallas, Waco, Austin, and San Antonio, and supports a large proportion of the State's population, as well as contributing very largely to its wealth. This belt is not composed entirely of the characteristic black soil, but contains various grades and types of more sandy soils, the latter occupying by far the greater proportion of the northern part of the area surveyed.

As indicated in a preceding chapter, the early settlers preferred the sandy soils, and it was only a little over twenty years ago that the black clay became generally recognized as especially adapted to cotton and corn. During the past few years, since the farmers have been

forced to consider a more diversified system of farming, attention has again been directed to the possibilities of the sandy soils.

A great deal of money has been made from cotton, and some from truck farming. These facts, together with the fact that this part of Texas has been largely settled since the civil war, causing it to advance for the most part unhampered by the period of reconstruction so keenly felt in some parts of the South, have placed the farming class on a plane of prosperity somewhat above that of the ordinary southern farming community. As a rule, the farmers are prosperous, and many are quite wealthy. The disadvantages of making one's home in the Houston black clay areas, where the roads are difficult to travel in wet weather, have induced some to build their homes on the sandy types adjoining, and to go back and forth to their farm work. It has also influenced others, after they have become well-to-do, to rent their farms to tenants and move to town.

About 80 per cent of the land on the Houston clay and Houston black clay is rented to tenants for a share of the products. The remaining 20 per cent is operated by the owners. The rented farms are owned by retired farmers or business men. On the sandy soils, which are much cheaper than the black clay soils, about 50 per cent of the occupants own their farms. The usual method of renting land all over the area is what is known as "a third and fourth." Under this system the landlord furnishes the land and the tenant does the farming, giving the landlord one-third of the corn and one-fourth of the cotton produced thereon. The landlord pays for ginning his share of the cotton. Very few farms are rented for money.

Most of the tenants are white, the negroes preferring town and city life rather than the isolation of the farms. Those tenants who are industrious and economical soon settle down and buy homes. The others lead a nomadic life, moving from place to place in their covered wagons. While making a crop many of them live in tents. If the crop looks poor they may abandon it before it matures. They are seldom able to pay cash for goods, are compelled to give a lien on their crops, and are charged from 20 to 30 per cent more than the current cash prices. Usually the merchant will not trust them unless the landlord goes on a note as security. To secure his creditors a tenant often mortgages everything he has. Everything movable may be legally attached, as the homestead laws exempt only the homestead. The credit system is regarded as an injury to the country, and is the natural outgrowth of one-crop farming and the tenant system. The system, however, is being abandoned, and it is only a question of time until this section will do business on a cash basis.

The farmers who cultivate their own farms are especially prosperous, and are becoming more so as their knowledge of diversified farming

increases and wider markets for their products are afforded. The success of the farmers of the Orangeburg sandy loam, between Paris and Mansfield schoolhouse, is having a helpful effect on the whole region. These farmers raise all they need except flour, sugar, and coffee, and they always have something to sell when they come to town.

Where the farmers operate their own farms the farms are usually small, ranging from 40 to 150 acres each; just large enough to profitably employ the labor of the owner and his sons. The farms of the retired class are usually quite large, ranging from 200 to 2,000 acres each. On the sandy prairies in the western part of the area there are some very large hay farms and a few large grazing farms. These range in size from 500 to 3,000 acres. Some large bodies of land in the area are held by nonresidents for speculative purposes.

Some farm laborers are hired for the first six months of the year, the usual wages being $15 a month with board and lodging. The independent operator hires as little as possible, and the tenant is seldom able to pay for labor. Near the large towns the farmers depend chiefly upon day labor. The busiest season is during cotton chopping, when the wages are $1 or $1.25 a day. A great deal of help is hired for cotton picking, but much of it is transient. This work is paid for by the weight of cotton picked, 50 cents a hundred pounds being the usual price. Cotton picking is always looked forward to by the negroes.

Cotton is the great staple crop of the area. Money has been and is being made in its production, but other industries have been too much neglected in the effort to produce this one crop. The great business interests of Paris, the commercial center of the county, are founded upon cotton. The natural productiveness of the Houston clay and the Houston black clay, and of some of the Red River bottom types has been so great that the planters have entirely neglected such matters as varieties, selection of seed, rotation of crops, and fertilization, all of which must soon receive consideration. On many of the older fields the continuous cropping of the soil for over a score of years has somewhat reduced their productiveness and favored the spread of the cotton root rot disease and the boll worm.

Throughout the thickly settled part of the area there are cotton gins at intervals of about 4 miles. The great bulk of the cotton is hauled to Paris after ginning and sold to the highest bidder in the open market. It is very seldom that a farmer knows how to grade his cotton, and he is somewhat at the mercy of the buyers. In order to insure the farmer the market price, the merchants of Paris have placed a buyer on the market, who bids only when he thinks the regular buyers are not offering the market price. In nearly all the small railroad towns there are cotton buyers. All of the cotton grown in Lamar County, and some from surrounding counties, is run through the cot-

ton compress at Paris before being shipped out of the State. There are several oil mills along the Texas and Pacific Railway, where the farmers dispose of their cotton seed at a fair price.

The days of unlimited range for stock have ended, but there are a few large herds of cattle on the sandy prairie in the vicinity of Maxey. Large tracts are fenced for pasture, and cattle range for nine or ten months in the year. All the prairies in the county at one time supported a luxuriant growth of native grasses, but they have nearly all been broken for the cultivation of other crops. In the vicinity of Maxey and Brookston, however, only about 15 per cent of the prairie has ever been put into cultivation, and large areas there are devoted to hay farming and stock raising. This is the only locality in the area where any special attention is paid to the production of hay, and it is an important crop in this part of the area chiefly because the soils are sandy and therefore not so well adapted to cotton and corn as are the black clay areas immediately to the south. The reason why no more attention is paid to the hay and grass crops in other parts of the area is because the winters are so short and mild that but little winter forage is needed to feed live stock.

The prairie hay farms produce a coarse variety of native hay. It is sometimes cut twice during the season. The average yield for the season is about 1¼ tons per acre. The prices range from $6 to $12 a ton, with an average of about $8 a ton. The pressed hay is stored in sheds to await shipment. Brookston lies in the southern edge of the hay district, and as much as 75,000 tons of hay have been shipped from that town in a single year.

Timothy and clover are being introduced. Johnson grass is being grown by some, and if cut in time makes a satisfactory hay, but if allowed to go to seed and spread it becomes troublesome. Alfalfa is becoming one of the important crops of the area, and especially so along the bottoms of the Red River and its tributaries. In the blackland country it will not thrive on spots infected with the cotton root rot fungus. It is a valuable crop on all the soils of the area, and in the best locations can be cut from three to five times in a season, with an average yield of 1 ton per acre from each cutting. The hay is in great demand, and the price ranges from $12 to $18 a ton. In the vicinity of Paris some peanuts are grown, and the hay from this crop is considered nearly as valuable as alfalfa.

Cowpeas have been introduced and are being grown to some extent on all the types of soil in the area. Some who have tried them on the Orangeburg clay are very enthusiastic over the results. The cotton on a piece of ground of this soil type, which had been planted to cowpeas the preceding year, was examined and compared with an adjoining field where cowpeas had never been grown. The difference in the

growing crops was very marked, although the methods of culture were precisely the same, both tracts being planted and cultivated as one field of cotton by the same man. The productiveness of the field where the cowpeas were grown was apparently greatly improved, and there was a noticeable difference in the mechanical condition of the soil.

The dairy industry throughout the area should be better developed. The stock raisers allow the young calves to range with the cows until they are fully matured, no attention whatever being paid to the production of milk and butter, except for family use. Large quantities of butter and cheese are imported annually. There are no cheese factories in the area, and there are no creameries except the small private ones near Paris, which are run in connection with dairy farms. There are five such farms, which furnish the city with milk and cream. In summer the cream is consumed largely by the ice-cream stands, while in winter it is made into butter. These farms are doing a profitable business. Cream sells for from $1 to $1.50 a gallon, depending upon the quality, and milk brings from 25 cents to 35 cents a gallon. Good creamery butter never sells for less than 25 cents a pound. The dairymen have been very successful, and the farmers are beginning to realize the possibilities in this direction.

The stock interests should be given more attention. A better grade of cattle should be introduced and a larger number put upon the market each year. Stock raising should be an auxiliary to farming throughout the area, and with the possibilities for growing alfalfa and other legumes there is no reason why it should not be. More forage crops should be grown, and instead of shipping nearly all the cotton seed out of the area, some of it should be ground up and fed to the stock.

On the sandy soils, and especially on the Orangeburg sandy loam, considerable attention has been paid to the cultivation of fruit. The Elberta is the commercial peach of the area, and large quantities are grown and shipped annually. The tree grows well upon almost any sandy soil, but does especially well on the Orangeburg sandy loam, the product of that soil being larger, and having a better color and finer flavor. The fruit is shipped about the middle of June to various northern markets. The Chinese Cling is a peach much grown for home consumption. It is well adapted to preserving, will stand shipment well, and its cultivation on a commercial scale might be profitable.

Apples, as a rule, do not do well. The Early June is the one most successfully grown because it ripens before extremely hot weather sets in. The Ben Davis, Arkansas Black, and Shockley are grown to some extent, but are not of as good quality as those produced where the climate is cooler. The cultivation of pears is also unsatisfactory,

owing largely, as with apples, to climatic conditions. The fruit trees are all short lived.

Truck farming and berry raising have become very important industries on the sandy soils, and especially so on the Orangeburg sandy loam. The supply has already largely outgrown local demand, and the truck growers have organized for the purpose of obtaining reduced freight rates to other markets. Lamar County cantaloupes are well known in the St. Louis markets for their superior quality and beauty. The last season one grower realized $100 an acre from his crop of cantaloupes. Blackberries and strawberries lead among the berry crops and are likewise very profitable. The latter are shipped by the carload to the northern markets. Gooseberries, currants, and raspberries make but an indifferent growth, the trouble being probably climatic. Early tomatoes do especially well. There are several canning factories in the area, but they find trouble in getting enough tomatoes to keep running at their full capacity. The tomato industry would be a profitable one for the area. There seems to be a general lack of knowledge of tomato culture, and the farmers of the sandy region need encouragement. The canning factories of the area also can peaches, okra, beans, and other fruits and vegetables in their seasons.

Two crops of Irish potatoes can be grown each season, and as many as 100 carloads have been shipped from the first crop, reaching the northern market from thirty to sixty days earlier than the Colorado potatoes. The second crop is somewhat inferior to the first and is not so extensively grown. Considerable difficulty is had in keeping the second crop through the winter, the trouble being that the farmers have never made provision for doing so. Some sweet potatoes are grown, but only for local use. The onion crop is becoming an important one, and several shipments are made annually.

With the exception of the northeastern and northwestern parts of the area the transportation facilities are good. The Texas and Pacific Railway extends along its southern boundary, with stations at an average interval of 4 miles. Extending north from Paris, through the middle of the area, is the St. Louis and San Francisco Railroad, with a number of stations affording outlets for farm products. Paris is the terminus for branches of the Atchison, Topeka and Santa Fe and the Texas Midland railways. These roads extend southward out of the area.

At present the freight rates are rather high, and there is considerable dissatisfaction on the part of merchants and truck growers here and, in fact, in all the counties bordering the Red River. The merchants and farmers of these counties and the merchants of New Orleans are striving for national aid in making the Red River navigable. Prior

to the war all the freight along the valley was carried in steamers on the Red River. It is claimed that navigation is feasible, and that it is largely a matter of keeping a Government boat in commission for the purpose of removing snags from the river. The opening of river navigation would offer a cheap means of transporting the cotton and other products to the New Orleans markets.

There are at present large tracts of Red River bottoms which have never been brought under cultivation, and there are other tracts under cultivation that are not worked to their full capacity. The cause of this condition is found in the difficulty of getting the crops to the surrounding hills, and also in the great distance to market, especially from the northeastern and northwestern parts of the area. River transportation would stimulate agriculture all along the stream and the rich alluvial bottoms would be worked to their full capacity.

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U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF.

# SOIL MAP

TEXAS
PARIS SHEET

SOIL PROFILE
(3 feet deep)

- Vernon fine sand: S, S
- Orangeburg sandy loam: Ssc, Ssc
- Orangeburg fine sandy loam: Sfs, Sfs
- Orangeburg silt loam: Sic, Sic
- Orangeburg clay: Sc, C
- Sanders loam: Ssc
- Houston silt loam: Sic, Sic
- Houston clay: Scc, Scc
- Houston black clay: C, C
- Luffkin clay: S, C
- Sharkey clay: C, C

LEGEND
S Sand
C Sandy clay
Ssc Sandy loam
Sic Silt loam
Sfs Fine sandy loam
Scc Clay loam
Sc Loam
C Clay
f Fine sand

Vs Vernon fine sand
Os Orangeburg sandy loam
Ofl Orangeburg fine sandy loam
Osi Orangeburg silt loam
Oc Orangeburg clay
Sl Sanders loam
Hl Houston silt loam
Hc Houston clay
Hbc Houston black clay
Lc Luffkin clay
Sc Sharkey clay

Scale 1 inch = 1 mile

Soils surveyed by
Thos. A. Caine and A. E. Kocher
1903.

Field Operations
Bureau of Soils
1903.